Northeastern University
College *of* Engineering

Please join us for a

SPECIAL SEMINAR

Tuesday, April 19, 2011
104G West Village
11:45 a.m. – 1:00 p.m.

"Solid-State Lighting – Energy Efficient Lighting with Group-III Nitride Semiconductors"

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ABSTRACT

Few things have changed as little as the way we light our living rooms. Yet almost synonymous with ingenuity the incandescent light bulb is set to take the path of gas guzzler cars. In light of rising atmospheric carbon levels, energy takes on the status of a new lead currency. Solid state lighting has taken on the goal to replace wastefully inefficient incandescent lighting and is on its way to outrun fluorescent lamps as well. Light emitting diodes (LEDs) and their organic cousins OLEDs are the prime contenders for high intensity, large area light sources, respectively. Key to both is the availability of a pn- junction in direct wide bandgap semiconductor. Indeed, the alloys of AlGaInN group-III nitrides allow for coverage of the entire visible spectrum of light and besides efficient LEDs, should also prove ideal for multijunction solar cells. The present best LEDs indeed employ a blue emitting GaInN/GaN quantum well structure within a GaN pn-junction. To render a full white spectrum, they convert a good portion to the longer wavelengths by help of a phosphor. Yet this is a point where significant new losses come into play. Our approach therefore is to supply all those longer wavelength colors also by direct emitting GaInN/GaN quantum wells, which requires a rather high alloy fraction of InN. The major challenges, however, are those of a performance droop with high injection densities and with longer emission wavelength (green gap problem). I will iterate on the latest developments of structural defect and piezoelectric polarization control in the development of direct green emitting LEDs. I will also highlight the role of our interdisciplinary center approaches in this work.

Professor Christian M. Wetzel is the Wellfleet Career Development Constellation Professor, Future Chips and Associate Professor of Physics Applied Physics and Astronomy at Rensselaer Polytechnic Institute, Troy NY. Interdisciplinary faculty Constellations at RPI have laid the foundation for larger collaborative programs such as major contributions in Core Research of the DOE Solid State Lighting Program and the newly implemented Smart Lighting Engineering Research Center at RPI. Dr. Wetzel directs a group of some ten doctoral students, postdocs, and a research professor on major aspects of aspects of the materials physics and device development of wide bandgap group-III nitrides. His particular interest is the efficient conversion between electricity and photons, e.g. in light emitting diodes and solar cells. Prof. Wetzel holds a doctoral degree in physics from the Technical University Munich, has performed postdoctoral work at Lawrence Berkeley Laboratory, California and Meijo University, Nagoya, Japan and has worked in semiconductor industry as the Green Project Manager at Uniroyal Optoelectronics Tampa, Florida. Prof. Wetzel is chair to many current and past conferences on group-III nitrides, his work has been published in over 150 journal publications with a total of over 2300 citations.

Refreshments will be served.